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# CALIPER BRAKE WITH DISENGAGED POSITION (SELF-CENTERING CALIPER BRAKE)

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The present invention relates to caliper brakes peripherally engaging a brake disc on both sides to brake it down and adapted to urge friction linings against either face of the brake disc when operated to brake. In caliper brakes of this kind, the brake body must be supported to "float" so that the caliper can adapt to the position of the brake disc as the friction linings wear down. This kind of caliper brake is acknowledged to be known in the preamble of patent claim 1.

Applicant's floating-mount caliper brakes are state of the art. At the customers', specific embodiments were found to generate grinding noises as the friction linings initially touch the disc. These noises were deemed to be unacceptable.

A first solution of the problem was seen in the provision of means for adjusting the air gap of the caliper-side friction surface by means of three screws and to use one or two compression springs to set the pressure the brake exerts on these screws. Under maximum operational load, the drive would at times experience a flexural torque acting to deflect the brake disc towards the brake mounting structure, the deflection exceeding the air gap of the brake. As a result, the friction lining constantly rubs against the armature disc under the pressure exerted by the compression springs. In many cases, such grinding noises

are unacceptable. For example, brakes in elevators are noise-silenced and their air gap cannot be increased as needed, resulting in a loud noise as the brake engages. Where the brake disc is part of an elevator drive motor, the brake engages during load changes (persons entering or leaving the elevator car). Electromagnetically disengaged caliper brakes are actuated in the absence of current by the corresponding compression spring of the brake.

As the brake disengages, i.e. as the armature disc is electromagnetically attracted onto the brake body, an air gap forms in which the brake disc is free to rotate. Grinding or slip noises are generated even if the brake and its mounting structure are manufactured to tight tolerances. These noises are the louder the greater the so-called "wobble" of the disc and the narrower the air gap is adjusted to be at the electromagnetically released brake. Still, an air gap so narrow is needed to ensure a low engagement noise of the brake.

On the basis of the above, it is the object underlying the invention to further develop a caliper brake of the kind initially stated so as to provide for, and maintain, a uniform air gap on both the left- and the right-hand side of the brake disc. Such a uniform air gap on both sides is to be provided even in case the friction linings wear unevenly.

This object is attained by the features stated in patent claim 1. A dual-arm rocker lever or bracket-type friction and clamping mechanism is fastened at one end to the axially movable armature disc and and is floatingly fastened at the other end to the brake housing or to the straddling caliper, which itself is fixed to the brake housing. Movements of the armature disc cause it to flex slightly from the starting position, whereby a uniform air gap will form on both sides of the brake disc. The fulcrum of the rocker arm device is located on the fixed bolt which floatingly supports the brake housing; the fixed bolt itself is anchored to a stationary machine housing.

As the brake is disengaged through an air gap having the width s, an air gap s/2 wide will form on both sides of the brake, whereby any grinding noise will be prevented reliably.

The present invention will be explained in greater detail under reference to the attached drawings.

Figs. 1-3 illustrate the principles underlying the inventive brake, that is:

Fig. 1 shows the brake in the engaged/braked condition;
Fig. 2 depicts the brake in the disengaged condition, showing the balancing effect of rocker arm 8;
Fig. 3 shows the brake in the braked-down condition with its friction linings substantially worn or brake disc 3 axially displaced through external influence;
Fig. 4 shows a view of the brake seen in the direction of arrow X in Fig. 3 or 5;
Fig. 5 shows a specific embodiment of an inventive brake;
Figs. 5a, b and c show additional embodiments; and
Fig. 6 shows a vertical section in parallel with fixed bolt 7.

The idea underlying the invention is to convert armature movements relative to the solenoid support to oppositely directed movements of the solenoid support itself, such oppositely directed movements then also being relative to the opposite caliper-side friction surface as the latter is firmly connected to the solenoid support. Adjustment of the starting position of the armature disc is effected by rocker lever 8 frictionally engaging stationary guide bolt 7.

Rocker lever 8 is a member shaped of spring-grade steel strip to have two opposite limbs 8A, 8B engaging both sides of fixed bolt 7, said limbs having friction linings 9 on their inner surfaces to maintain the frictional engagement of the rocker lever with fixed bolt, as shown in Fig. 4. The axial frictional force exerted on the guide bolt is determined by the amount of the resilient outward deflection and by the nature of the friction linings. The rocker lever has two oppositely disposed flexible tongues 15A, 15B, with one tongue 15A connected to armature disc 4 and the other tongue 15B connected to caliper 2 both in a clearance-free manner. The lever ratio of the tongues to the center of the guide bolts is approximately 1:1.

With the brake engaged and the position of the brake disc altered by some load change, tongues 15A, 15B act to axially shift the clamping mechanism in its entirety on the guide bolt. Energizing brake solenoid 14 will move armature disc 4 towards solenoid support 1. Armature-side tongue 15A transfers this movement to rocker lever 8, which will initiate an opposite directed movement of tongue 15B if its frictional engagement of guide bolt 7 is sufficient. As a result, the air gaps between brake disc 3 and the two friction linings will be approximately the same and equal to s/2.

Fig. 5a shows another embodiment, the difference being that rocker lever 8 and its friction linings 9 cannot shift on bolt 7 directly; instead, another bracket 17 is provided and connected with bolt 7.

Figs. 5b, 5c show still another embodiment in which again a separate bracket 17 is connected with bolt 7, with axial displacement effected between rocker lever 8 and bracket 17 by the frictional engagement of friction lining 9.

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List of Reference Characters

| | |
|---|---|
| 1 | brake body/solenoid support |
| 2 | caliper |
| 3 | brake disc |
| 4 | armature disc |
| 5 | left-hand friction lining |
| 6 | right-hand friction lining |
| 7 | fixed bolt |
| 8 | rocker lever |
| 8A | right-hand limb of 8 in Fig. 4 |
| 8B | left-hand limb of 8 in Fig. 4 |
| 9 | friction linings on rocker lever 8 |
| 10 | fastening screw on the caliper |
| 11 | fastening screw on the armature disc |
| 12 | stationary housing |
| 13 | fulcrum of 8 on fixed bolt 7 |
| s | air gap between brake body 1 and armature disc 4 |
| s/2 | left- and right-hand air gap between brake disc 3 and left- and right-hand friction linings 5, 6 |
| a | distance between stationary housing 12 and caliper 2 |
| 14 | solenoid in 1 |
| 15A | flexible tongue, screwed onto armature disc 4 |
| 15B | flexible tongue, screwed onto caliper 2 |
| 16 | compression springs in brake |
| 17 | bracket (or similar member) |